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RACIAL DIFFERENTIATION IN NEARCTIC SPECIES OF DIANTHIDIUM (HYMENOPTERA, APOIDEA)¹

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This study of our North American species of *Dianthidium* is not intended to be monographic; yet all the types located on the Pacific Coast have been examined, and the interpretations of Herbert F. Schwarz, who has studied other types in New York, Philadelphia, and Washington, have been followed in the main. There is little or no doubt, therefore, about the strict application of the names here involved.

The species herein recognized are distinguishable by such morphological characters as structure of the mandibles in the females, modification of the apical tergite, ventrite, and the genitalia in the males, and by size and sculpture in both sexes. The subspecies, on the other hand, are differentiated by variation in the extent and color of the maculations, by the character of the pubescence, and by relatively minor differences in the sculpture. On the Pacific Coast, in several widely distributed species, there is a progressive increase in maculation, both in extent and in depth of color, from British Columbia and Washington southward to southern California. Farther south, in Lower California, the tendency is reversed, specimens from this region

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exhibiting a contraction of the maculations, although the color may remain equally bright. In certain species, however, in the more arid or desert portion of the habitat, there is a distinct bleaching of the color. Another interesting variation is the conspicuous increase in the length of pubescence shown by specimens of two species of the Sierra Nevada region.

The material basis of this study has been the collections of the California Academy of Sciences and the University of California Citrus Experiment Station, the Cazier collection now belonging to the American Museum of Natural History, and a small but important set of specimens from the collections of the Bohart brothers and of Messrs. Linsley and Michener.

In the following key, the females of nearly all our species are distinguished by characters that are almost exclusively morphological. The key, on this account, may prove to be difficult for the beginner who has no authentically identified specimens for comparison; in such a case it should be supplemented by use of keys that have been published by Schwarz.

KEY TO THE FEMALES OF NEARCTIC SPECIES OF *Dianthidium*

1. Large species, about 12 mm. long; sides of tergites 2 and 3, or 2 to 5, more or less inflated, with the posterior angles widely diverging from base of following segment 2.
 Smaller species, about 10 mm. long, or less; sides of middle tergites not inflated 3.
2. Sides of tergites 2 to 5 strongly inflated; tergite 6 broadly truncate at apex, with posterior corners rounded; spur of hind coxæ long and conical *singulare* (Cresson).
 Sides of tergites 2 and 3 weakly inflated but strongly diverging from base of following segment; tergite 6 broadly rounded at apex; spur of hind coxæ short and stout *cressonii* (Dalla Torre).
3. Coxæ of fore legs armed with a short hairy spine at apex 4.
 Anterior coxæ unarmed at apex, rarely with a rounded crest on ventral surface 6.
4. Large species, 8-10 mm. long, abdomen nearly 4 mm. wide; markings of head and thorax more or less reddened; lateral face-marks ending broadly above antennæ 5.
 Smaller, about 8 mm. long; maculations yellow throughout; lateral face-marks narrowed above *simile* (Cresson).
5. Punctures of frons and vertex coarse and close, becoming a little more separated on vertex, especially behind ocelli *curvatum* (Smith).
 Punctures of frons and vertex as in *curvatum*, but slightly closer and nearly uniformly spaced throughout *sayi* Cockerell.

6. Punctures of frons more or less close but separate enough to leave shining interstices 7.
- Punctures of frons very dense, so that the surface is more or less dull; mesoscutum also dull and densely punctured 15.
7. Mandibles with a small preapical notch, but preapical tooth very blunt or hardly developed 8.
- Mandibles with a distinct preapical tooth, set off on one side by a preapical notch and on the other side by a more or less concave cutting edge 10.
8. Mandibles with the cutting edge straight, relieved only by small acute notch preapically; the apical tooth small, not, or hardly, projecting beyond contour of cutting edge 9.
- Mandibles with a large well-developed apical tooth, followed by a broad-angled notch, which thus sets off a low blunt preapical tooth, with the cutting edge beyond straight; ventral scopa more or less fuscous.
desertorum n. sp.
9. Punctures of face, vertex, and mesoscutum nearly uniformly coarse and close, and only a little finer than those of mesopleura; large, robust species, resembling *curvatum* and *sayi*, with legs mainly red.
subrufulum n. sp.
- Punctures of mesoscutum fine and close, becoming a little finer and denser on anterior middle; those of frons and vertex somewhat coarser; those of mesopleura much coarser *pudicum* (Cresson).
10. Mesoscutum with the interstices between the punctures more or less shining 11.
- Mesoscutum dull, the interstices between the very close punctures tessellate *fraternum* n. sp.
11. Punctures of frons more or less coarse and at least equal to those of clypeus 12.
- Punctures of frons and vertex fine, uniformly and closely spaced, fading out on posterior border of vertex and subequal to those of mesoscutum, a little finer than those of clypeus and much finer than those of mesopleura *platyurum* Cockerell.
12. Punctures of mesoscutum not becoming appreciably finer and denser on anterior middle 13.
- Punctures of mesoscutum becoming distinctly finer and denser on anterior middle; punctures of frons, vertex, and clypeus rather coarse, uniformly close, and subequal to the coarser punctures of mesoscutum; legs red *concinnum* (Cresson).
13. Punctures of frons, at least in the middle, somewhat separated, some of the interstices equal to one-half to one puncture-width 14.
- Punctures of frons almost touching, honeycomblike, and about as close as those of mesoscutum *subparvum* Swenk.
14. Punctures of clypeus, frons, and mesoscutum moderately fine and subequal, becoming a little separated on frons, with those of vertex a little finer and sometimes a little sparser behind ocelli.
parvum (Cresson).

- Punctures of clypeus and frons rather coarse and rather well separated on middle of frons; those of vertex finer, becoming more widely spaced behind ocelli; punctures of mesoscutum very close throughout and slightly finer than those of frons *profugum* Cockerell.
15. Mandibles with distinct apical and preapical teeth, the cutting edge within concavely arcuate 16.
Mandibles with or without a small acute preapical notch, the cutting edge within straight, so that a preapical tooth is little or not at all indicated 17.
16. Apical and preapical teeth of mandibles large, broad at base, the inner one blunt, both together occupying half the apical cutting edge; punctures of mesoscutum moderately coarse, not becoming denser on anterior middle *ulkei* (Cresson).
Teeth of mandibles smaller, acute; arcuate portion of cutting edge fortified by a carina on inner surface close to margin; punctures of mesoscutum rather fine and dense, becoming finer and denser on anterior middle *consimile* (Ashmead).
17. Mandibles with a preapical notch, but apical tooth short and blunt, hardly projecting beyond contour of cutting edge; mesoscutum finely and densely punctured, the sculpture finer and denser on anterior middle *plenum* n. sp.
Mandibles with a distinct apical tooth strongly projecting beyond contour of remainder of cutting edge, but without a preapical notch and tooth; punctures of mesoscutum nearly as fine as in *plenum*, but the sculpture not appreciably finer and denser on anterior middle.
macswaini n. sp.

GROUP OF DIANTHIDIUM SINGULARE (CRESSON)

Here belong two remarkably large and handsome species, *D. singulare* and *cressonii*, which have the sides of middle tergites peculiarly inflated.

Dianthidium singulare (Cresson)

The male of *singulare* has the seventh tergite strongly trilobed, with the median lobe narrowly triangular, the emargination each side of it deep and flaring on outer side, and the lateral lobes very obliquely truncate from within outward, with outer margin strongly rounded. The lateral lobes thus appear to be divergent and subtriangular in shape, with rounded apex.

Dianthidium singulare singulare (Cresson).

The type from Nevada has the yellow band on tergites 1 and 2 broken into three spots, and that on tergite 3 broken into four spots, although the two inner spots are almost confluent.

In a male previously reported by Cockerell from Meadow Valley, Plumas Co., California (Van Dyke), the bands on the first two tergites are broken into three spots, but that on the third is entire and encloses two black spots, as do also the following bands. A female from Cisco, California, June 13, 1939 (G. E. Bohart), has similar markings, except that the two black spots in the band on tergite 3 break through on the anterior margin.

***Dianthidium singulare perluteum* Cockerell.**

In this race from southern California, the abdominal bands are all entire. In the Academy collection are 7 specimens of both sexes, from Santa Rosa Peak, 8,000 feet, June 22; Idyllwild, San Jacinto Mts., June 19 to 23; Forest Home, San Bernardino Mts., June 17 and 18 (Van Dyke); and from Mill Creek, 6,000 feet, San Bernardino Mts., on *Chrysothamnus*, Oct. 11 (I. McCracken). I have also taken it at Bear Valley, San Bernardino Mts., on *Eulophus*, Aug. 10; at Forest Home on *Cirsium*, July 5; and at Mill Creek, 6,000 feet, on *Erysimum*, June 21. At 6,200 feet, Mill Creek, on Sept. 7, 1935, a female was discovered building its nest on the side of a partially buried rock in the creek bed, and 2 males that had followed it to the nesting site were captured. This nest was inspected several times during the following summer, but nothing issued. During the second winter, the creek bed was scoured out by a severe flood, and the rock and all must have been swept away.

***Dianthidium cressonii* (Dalla Torre)**

This species has the sides of the middle tergites less inflated and the apex of the last tergite much less truncate than in *singulare*. I have not seen the male.

One female, Ward, Colorado, Aug. 10 (Cockerell); another, Nederland, Colorado, at flowers of wild rose, July 1, 1939 (Timberlake).

GROUP OF DIANTHIDIUM CURVATUM (SMITH)

The *curvatum* and *ulkei* groups are closely allied and similar in the structure of the seventh tergite of the male. This sclerite in both groups is broadly truncate at apex, with a shortly projecting median lobe or tooth. In the *curvatum* group, the median lobe is set off by a small but distinct notch on each side of its

base; the sixth ventrite is rather short and has its apical margin broadly rounded; the front coxæ are armed at the apex with a short spine projecting horizontally, as in certain species of *Colletes* and *Nomada*; and the sagittal lobes of the genitalia are devoid of hair. In the *ulkei* group, the median lobe of the seventh tergite is but little more than a short projection from the otherwise truncate margin, the notch on each side of it being more or less evanescent (more distinct in *ulkei* than in the other species of its group); the sixth ventrite is produced medially, with the sides of the margin converging to a comparatively narrow, rounded, subtruncate or even notched apex; the front coxæ are unarmed; and the sagittal lobes of the genitalia are fringed with hair on outer margins or provided with a short erect pile on the dorsal surface.

The males of the *curvatum* group may be distinguished as follows:

1. Large species, generally over 9 mm. in length, with the maculations more or less reddened, especially on thorax, legs, and abdomen; lateral face-marks ending more or less broadly at level of anterior ocellus 2.
- Black, with yellow maculations; lateral face-marks narrowed above and ending at level of middle of frons; fringe of hair on fifth ventrite thin, and that on fourth considerably less developed *simile* (Cress.).
2. Fringe of hair on fourth and fifth ventrites rather thin, but not less developed on the fourth segment *curvatum* (Smith).
- Venter very hairy, with a dense fringe on fourth and fifth segments, and on sides of the sixth *sayi* Ckll.

***Dianthidium simile* (Cresson)**

Of this species I have examined a female from Browns Mills, New Jersey, and a male from Ogunquit, Maine, kindly loaned by Mr. Schwarz.

***Dianthidium curvatum* (Smith)**

The Academy collection includes the following material: a pair from Mobile, Alabama, Sept. 19, 1939; 1 female, Fort Morgan, Alabama, Sept. 20; one pair, Eureka Springs, Ouachita Mts., Arkansas, Sept. 4; 1 male, Hot Springs, Arkansas, Oct. 1; and 4 males, Branson, Missouri, Sept. 7 and 11, 1939 (all Van Dyke).

The Fort Morgan female has the markings of clypeus, vertex, mesoscutum, scutellum, and first two tergites considerably reddened, the band on vertex narrow and continuous, the legs little blackened at base, the two spots on tergite 5 small and round, and the marks on mesoscutum extended backward on lateral margins. It thus resembles *sayi* in many ways, but the punctures of frons and vertex are sparser. The Missouri and Arkansas specimens tend to have the marks on anterior margin of mesoscutum reduced and sometimes not extending outward beyond the inner end of the scale-like expansion of tubercle.

D. curvatum and *sayi* are very close structurally and may ultimately prove to be races of one species, but the punctures of the frons and vertex are sparser in *curvatum* in both sexes, and the venter of the male of *sayi* is much more densely hairy. The genitalia and accessory parts are nearly identical in the two species.

D. floridiense Schwarz agrees with *curvatum* except in color and in my estimation is merely a race of that species.

Dianthidium sayi Cockerell

This species was described by Say (1824) under the preoccupied name of *interruptum*, from Missouri. Although Missouri gained statehood in 1821, it is possible that Say cited the locality loosely, and it seems probable that his types were captured farther west. At any rate, by modern records the species is known to occur only as far eastward as the western parts of Kansas and Nebraska.

A series including both sexes, from Lewiston, Idaho, July 14-22, 1925 (C. L. Fox), is in the Academy collection. One specimen is marked "*Gaillardia*," and perhaps all were taken on that flower. Among specimens submitted by Messrs. Linsley and Michener were 2 males of *sayi* from Utah, one taken at Trenton, Aug. 23 (Knowlton and Hardy), the other at Hooper, Sept. 19 (D. E. Hardy). I also have specimens from Salt Lake City, Utah, and from Boulder, Denver, and La Junta, Colorado.

From Mesilla, New Mexico, Cockerell has described the race *xerophilum*, which has the red or ferruginous color spread over nearly all the head and thorax and a part of the abdomen.

GROUP OF *DIANTHIDIUM ULKEI* (CRESSON)

The males of this group may be distinguished as follows:

1. Species 9 mm., or less, in length; apex of sixth ventrite not notched; maculations yellow 2.
 Larger, similar to *curvatum* and *sayi* in size and maculations and with more or less red suffusions, especially on legs and venter; apex of sixth ventrite distinctly notched *subrufulum* n. sp.
2. Frons and mesoscutum shining, the punctures close but not dense; median lobe of seventh tergite set off by a very shallow emargination on each side 3.
 Frons and mesoscutum dull and densely punctured; notch on each side of median lobe of seventh tergite small but usually distinct; venter very hairy, with a long fringe on segments 2 to 5 and on each side of 6 at base *ulkei* (Cress.).
3. Frons and mesoscutum finely and closely punctured, the punctures finer than those of clypeus and much finer than those of mesopleura; venter hairy and sagittal lobes of genitalia fringed laterally *platyurum* Ckll.
 Frons and mesoscutum more coarsely punctured, the punctures subequal to those of clypeus and only a little finer than those of mesopleura; punctures of frons a little separated; fringes of ventral segments very thin, the sides of the sixth with short erect hair; sagittal lobes shallowly furrowed lengthwise above and invested with a fine erect pile.
desertorum n. sp.

***Dianthidium subrufulum* new species**

Along with the few specimens of *curvatum* from Missouri and Arkansas, Van Dyke collected a large series of a similar species, which is liable to be confused with either *curvatum* or *sayi*. The male differs from either of those species in having the apical lobe of the sixth ventrite with nearly straight convergent sides and the rather narrow apex distinctly notched. The sagittal lobes are also rather densely fringed with hair. (In *curvatum* and *sayi* the sixth ventrite is broadly and evenly rounded at apex, and the sagittal lobes are glabrous.) The female has the punctures of frons and vertex a little finer and considerably closer, especially on each side of vertex, than in either *sayi* or *curvatum*. In the mainly ferruginous legs, it resembles *sayi*, although yellow stripes are generally present at base of tibiae. In the black thorax and abdomen with yellow maculations, it resembles *curvatum*; yet sometimes the sternum, propodeum, and base of abdomen are more or less red or suffused with red. Actually, *subrufulum* is

closer to *ulkei*, but its considerably larger size and the notch at apex of sixth ventrite of the male will distinguish it. Schwarz described *D. ulkei* var. *cooleyi*, from Montana, as having ferruginous legs, but he made no claim that it was distinguishable from *ulkei* in any way except color.

MALE.—Size and form as in *curvatum*. Black; the tegulæ, ground color of legs, venter, reflexed sides of first tergite, and sometimes sides of propodeum above hind coxæ, ferruginous red. Scape beneath and at base more or less reddened, but flagellum black. Front and middle coxæ black, except apex, but hind pair nearly all red except the yellow spurs. Spot at apex of femora above, stripe on front and middle femora behind (sometimes evanescent), broad stripe on outer side of front and middle tibiæ, basal mark and preapical transverse band on outer side of hind tibiæ, and stripe on basitarsi, yellow. Maculations of head, thorax, and abdomen bright yellow, although generally a little paler on face. Markings include mandibles, except apical margin; clypeus; small supraclypeal spot; lateral face-marks nearly reaching summit of eyes and generally a little more pointed above than in *curvatum*; stripe behind upper part of eye, sometimes extended to form interrupted band across vertex (the portion on vertex sometimes divided into four spots); dot or spot on frons; large mark on tubercles; curved mark on tegulæ; mark on each side of anterior margin of mesoscutum, generally rather small, but sometimes extended to lateral margin; spot on axillæ; continuous band at apex of scutellum; band on tergites 1 to 5; and most of tergite 7. Band on tergite 1 interrupted on each side. Bands on tergites 2 to 5 biarcuated by a broad anterior emargination in middle anteriorly and by a shallower emargination on each side posteriorly, those on 4 and 5 narrowly interrupted medially, that on 3 sometimes interrupted, and that on 2 most frequently continuous. Spur on hind coxa large and acute. Tergite 7 as in *ulkei*. (Nearly the same as in *curvatum* and *sayi*, but the median tooth less set off by a small emargination on each side of its base.) Puncturation throughout similar to *curvatum*, but a little finer and considerably sparser on frons and vertex. Mesoscutum a little dullish from a minute tessellation between the close punctures. Pubescence about as in *curvatum*, the vestiture of venter much less dense than in *sayi*. Wings rather dark fuliginous, the nervures black. Length, 9–11 mm.; anterior wing, 9 mm.; width of abdomen, about 3.9 mm.

FEMALE.—Similar to male. Mandibles black, and scape less reddened than in males. Yellow of clypeus divided into two spots by a broad median black area. Supraclypeal mark absent, or rarely represented by a yellow dot. Legs ferruginous red, with a small spot at apex of middle and hind femora and basal spot or stripe on outer side of tibiæ, generally reaching middle on front and middle pair, yellow. Tarsi sometimes a little infuscated or even blackish, except on one or two apical joints. Yellow bands on tergites 2 to 5 rather broadly interrupted medially, with inner ends of marks more or less pointed on 2 and 3, the two marks on tergite 5 lacking the portion laterad of the usual posterior emargination. Tergite 6 and venter black, but reflexed

sides of tergite 1 more or less red. Band on tergite 1 usually interrupted on each side, but occasionally continuous. Ventral scopa yellowish. Length, 8-10 mm.; anterior wing, 8 mm.; width of abdomen, nearly 4 mm.

In both sexes the red coloration is sometimes extended over a large part of sternum, most of propodeum, and lower part of metapleura, with more or less red suffusion on dark parts of first two tergites and, more rarely in male, on lateral margins of following tergites and on apical margin of the sixth. The male occasionally has a yellow dot on middle of anterior margin of the mesopleuron.

Holotype, male, and allotype, Branson, Missouri, Sept. 15, 1939. Paratypes as follows: 14 males, 26 females, Branson, Missouri, Sept. 7-16, 1939; 3 males, 7 females, Eureka Springs, Ouachita Mts., Arkansas, Sept. 4 and 5; and 7 males, 7 females, Hot Springs, Arkansas, Oct. 1, 1939 (all E. C. Van Dyke).

Types in collection of the California Academy of Sciences.

Dianthidium ulkei (Cresson)

KEY TO THE SUBSPECIES, OR VARIETIES, OF *ulkei*, FEMALES

1. Legs black, with yellow or cream-colored markings 2.
 Legs light reddish brown, with a yellow stripe of variable length on tibiae;
 venter also more or less reddish brown (Musselshell and Billings, Mon-
 tana) *cooleyi* Schwarz.
2. Markings yellow 3.
 Markings cream color; outer side of tibiae pale; an elongated spot on
 frons and large band behind upper part of eyes (Santa Fe, New
 Mexico) *perterritum* Ckll.
3. Maculations full on mesoscutum, axillae, scutellum, mesopleura, and sixth
 tergite 4.
 Maculation on parts named above reduced, the mesoscutum and axillae
 sometimes entirely black; sixth tergite entirely black or with two yellow
 dots (Washington, Oregon) *reductum* n. subsp.
4. Mandibles yellow, except on outer margin and apex; stripe behind eyes
 extending whole length of eye; two yellow spots on a band between
 antennae above usual supraclypeal mark; frontal spot large, more or
 less oval; abdominal bands very broad, mostly entire, except on middle
 segments, the posterior emarginations generally absent except on first
 and last segments (southern California) *davidsoni* Ckll.
 Mandibles with a small yellow spot or entirely black; no yellow mark
 between antennae; stripe behind eyes shorter; frontal spot more parallel-
 sided; abdominal bands less broad, interrupted medially on tergites 2
 or 3 to 6 and often more or less emarginate behind on each side (Colo-
 rado to northern California) *ulkei* (Cress.).

***Dianthidium ulkei ulkei* (Cresson).**

D. ulkei was described from Utah and has been recorded by Cockerell from New Mexico and Colorado and by Swenk from Nebraska, where an undermaculated variety was observed. The female typically has a yellow spot at base of mandibles, which is almost always present in California material but absent in all Colorado females that I have seen.

Typical *ulkei* is represented in the Academy collection by a large series from Twain Harte, 4,000 feet, Tuolumne Co., California, on *Grindelia*, July, 1937 (Blaisdell); and by one or more specimens from each of the following localities: Meadow Valley, Plumas Co., June 30 and July 4, 1924 (Van Dyke); hills back of Oakland, July 29, 1929 (E. C. Zimmerman); Buck Creek, Modoc Co., July 21 and 25, 1922 (C. L. Fox); Mt. Lassen, 6,000–8,000 feet, Aug. 2, 1938 (Van Dyke); Myers, Humboldt Co., July 7, 1937 (Van Dyke); Carrville, Trinity Co., June 30, 1931 (Van Dyke); Huntington Lake, 7,000 feet, Fresno Co., July 30, 1919 (Van Duzee); Mt. St. Helena, May 12, 1926 (Van Duzee); Glacier Lodge, Big Pine Creek, 8,000–11,000 feet, Inyo Co., California, Aug. 1929 (I. McCracken); Bryce Canyon, Utah, June 21, 1933 (O. H. Swezey); Bluff, Utah, on *Aster*, Sept. 14, 1938 (I. McCracken); and Lake of the Woods, Klamath Co., Oregon, July 10, 1934 (Van Dyke).

The following material of *ulkei* has been recorded by Cockerell, the males as *parvum* and the females as *consimile*: males, Huntington Lake, 7,000 feet, Fresno Co., California; females, Cascada, 6,000 feet, Fresno Co.; males and females, Cayton, Shasta Co.; and males from Strawberry Valley, Eldorado Co., California, and from Ashland, Oregon.

In the Cazier collection (American Museum), *ulkei* is represented from Safford, Arizona, and from the following localities in California: Davis; Mammoth Lake and Hot Creek, Mono Co.; Carson Pass, 8,000 feet; and north of Bishop, Inyo Co. (all Bohart).

The female from Mt. St. Helena lacks the yellow spot on mandible, but is otherwise fully maculated. The female from Glacier Lodge also lacks yellow on mandibles and is otherwise somewhat undermaculated, having the yellow bands on tergites 2 to 5 well

interrupted medially and the yellow on tergite 6 reduced to two round, well-separated spots.

***Dianthidium ulkei davidsoni* Cockerell.**

This was described from southern California, where it is found in the mountains. The female has the yellow mark on mandible very large, black mark on clypeus small or absent, a yellow mark or two dots usually present between antennæ (above the usual supra-clypeal mark), frontal spot large, and bands of abdomen very broad, continuous, and little if at all emarginate behind, except on tergites 1 and 6. The male differs from typical *ulkei* chiefly in having the posterior emarginations of abdominal bands much smaller.

In the Academy collection *davidsoni* is represented by a female from Antioch, Contra Costa Co., Sept. 9, 1936 (Van Dyke); a female from Piñon Flat, San Jacinto Mts., June 21, 1941 (Van Dyke); and a male from Pinnacles, San Benito Co., California, Aug. 17, 1933 (J. T. Howell and L. S. Ross). A male from Mill Creek, San Bernardino Mts., has been recorded by Cockerell as *parvum*.

I have collected it at Camp Baldy and Big Pines Camp, San Gabriel Mts.; at Pinecrest, Arrowhead Ranger Station, Bear Valley, Mountain Home Creek, Mill Creek, and Vivian Creek trail, San Bernardino Mts.; and at Idyllwild, San Jacinto Mts. These localities range from about 4,000 to 7,000 feet in altitude.

***Dianthidium ulkei reductum* new subspecies.**

This is a considerably undermaculated form occurring in parts of the Northwest and represented at least by individual variants farther east, as noted by Swenk in Nebraska. The putative female of *D. heterulkei* described by Schwarz seems to belong here, but *heterulkei* was based on a male with apparently good morphological characters. The most distinctive characters of *reductum* are the usually very small markings of the thorax, which is sometimes almost entirely black except on tegulæ and tubercles, and the entirely, or almost entirely, black sixth tergite of the female.

FEMALE.—Like *ulkei* in puncturation, pubescence, and structure of mandibles. Mandibles entirely black. Anterior margin and broad median stripe on

clypeus, black. Lateral face-marks normal. Frontal spot small and linear. No marks on vertex, and the stripes behind eyes short. Spots on anterior margin of mesoscutum very small. Spots on apex of scutellum small. Spots on axillæ and mesopleura and stripes on femora, evanescent. Stripes on tibiæ rather narrow; stripe on hind pair broad at base, with a narrow extension on dorsal margin nearly to apex, where it curves forward. Basitarsi immaculate. Tergites 1 to 5 each with a yellow band, broader on apical segments, well interrupted medially on 2 to 5 and emarginate behind on each side. Emarginations rather large and deep on tergite 1 and becoming progressively smaller on following segments, those on 4 and 5 tending to become enclosed. Tergite 6 black, with a suffused yellow dot on each side.

Two paratypes (Madras, Oregon) have a supraclypeal dot or small spot, stripe behind eyes longer, markings on mesoscutum, axillæ, scutellum, and mesopleura rather well developed, but bands on tergites 2 to 5 well interrupted medially, and tergite 6 either entirely black or with two evanescent dots.

MALE.—Markings of head and thorax as in female, except usual sexual difference. Supraclypeal mark small. Spots on axillæ and mesopleura absent. Yellow stripes of tibiæ broad, but on hind pair restricted by a broad black extension from the under side before the apex. Basitarsi maculated on outer side. Band on tergite 1 divided into three spots, those on 2 to 5 slightly interrupted medially and broadly emarginate behind on each side. Tergite 6 black, with a small transverse sinuate mark on each side. Tergite 7 yellow, except basal margin.

In paratypes there may be a short stripe on front and middle femora, the hind tibiæ may lack the broad dark subinterruption, and the yellow lines on tergite 6 may extend far mesad and become bisinuate. The allotype has the yellow marks on tegulæ and tubercles unusually small.

Holotype, female, and allotype, Longmire, Ranier National Park, Washington, July 22, 1919 (C. L. Fox). Paratypes as follows: 1 male, 2 females, Madras, Oregon, July 29, 1937 (Van Dyke), and 2 males, Lewiston, Idaho, July 17 and 21, 1925 (C. L. Fox). Types in collection of the California Academy of Sciences.

A female of *ulkei* from Dripping Springs, New Mexico, Aug. 10 (Townsend), in American Museum, agrees well with *reductum* in most respects. It differs from the type of *reductum* in having the markings paler yellow or almost cream color and the dark portion of tegulæ bright ferruginous. It thus shows intergradation with *perterritum* Ckll.

Swenk has recorded *reductum*-like specimens from Nebraska (Sioux and Dawes Counties). Schwarz has also recorded undermaculated *ulkei* from Three Sisters, Oregon, which I presume

were similar to paratypes of *reductum* from Madras. He has also recorded specimens of *ulkei* from British Columbia (Fairview, Keremeos, Vernon, and Summerland), but made no comment on their markings.

It thus seems that *ulkei* tends to be more or less undermaculated in various parts of the periphery of its range. However, as it is probable that the reduction of the maculations has occurred independently in different regions, I would hesitate to refer the Dripping Springs specimen to *reductum*, which race should be considered as properly restricted to the Northwest.

***Dianthidium desertorum* new species**

In the contour of seventh tergite of the male, this species is very similar to *ulkei*, but the parameres of stipites, instead of the sagittal lobes, are fringed with long hairs. The female differs from other species of the United States, except *concinnum*, in having the ventral scopa fuscous; but the legs are black, with yellow markings. It differs in markings and other ways from *platyurum* and *profugum* from Lower California.

MALE.—Black, with clear lemon-yellow markings. Large mark on basal half of mandibles, clypeus, lateral face-marks narrowed above, small supra-clypeal mark, stripe behind upper part of eyes and dot on posterior orbits at anterior end of eyes, large mark on each side of anterior margin of mesoscutum, broad continuous band apically on axillæ and scutellum, small spot on mesopleura and large mark on tegulæ and tubercles, yellow. Apex of femora broadly, broad stripe on front and middle femora behind, broad stripe on outer side of tibiæ, and stripe on basitarsi, yellow. Hind tibiæ with an enclosed black or brownish spot. Tergites 1 to 6 each with a broad yellow band, that on 1 interrupted, the others with broad posterior emarginations on each side, and those on 3 to 6 notched medially in front. Tergite 7 yellow except basal margin; its subhyaline apical margin unusually narrow. Head and thorax shining. Punctures of frons moderately coarse and a little separated; those of vertex much finer and closer. Punctures of mesoscutum similar to those of frons, but closer and becoming dense on anterior middle. Punctures of mesopleura coarse and close. Abdomen a little dullish, punctured about as usual, except that punctures of seventh tergite are fine and sparse. Pubescence whitish, rather long and loose, with numerous long erect hairs on mesoscutum, besides shorter subappressed hair. Hair of vertex and mesoscutum pale brownish ochreous. Hair of venter sparser than usual, but there is a dense transverse apical tuft on segment 3. Length, 9 mm.; anterior wing, 7 mm.

FEMALE.—Clypeus, except anterior margin and a thin uneven line on dorsal margin, broad lateral marks narrowed above, minute dot on supraclypeal area, stripe behind whole length of eye but interrupted below middle, large anterior marks on mesoscutum, reaching lateral margins, broad apical band on axillæ and scutellum, large marks on tubercles and tegulæ, and irregular, medium-sized mark on mesopleura, lemon yellow. Markings of legs as in male, except on basitarsi, which are marked with a basal spot only on the hind pair. Tergites 1 to 5 each with a broad yellow band, slightly interrupted medially on 2 to 5 and broadly interrupted on each side on 1. Posterior emarginations on each side are of medium size and represented by enclosed black spots on 4 and 5. Tergite 6 with two large roundish and well-separated yellow marks. Mandibles with an acute apical and a very short blunt preapical tooth, the latter, together with concave cutting edge within, forming a bisinuate margin. Pubescence and puncturation as in the male, the punctures of apical tergite, however, about as in other species. Ventral scopa fuscous, becoming whitish on apical segment. Length, 8 mm.; anterior wing, 7 mm.

A paratype from Borego differs in having a rather broad median black stripe on clypeus, enclosing a yellow dot above, the yellow stripe behind eyes nearly obliterated on anterior half, the yellow stripe on front tibiæ abbreviated apically, yellow of hind tibiæ confined to basal half, spot on mesopleura very small, and ventral scopa more a fulvous-brown tinge. Another paratype from Tahquitz Canyon differs in having a supraclypeal spot, the emarginations of the yellow band on first tergite not quite breaking through, and those on following segments represented by enclosed black spots.

Holotype, male, and allotype, collected 2 miles north of Palm Springs, California, on *Hyptis emoryi*, Mar. 7, 1936 (Timberlake). One female (paratype), Palm Canyon, Borego Valley, San Diego Co., May 21, 1941 (R. C. Dickson). Types in collection of the Citrus Experiment Station. Another female (paratype) in the Bohart collection, from Tahquitz Canyon, near Palm Springs, Apr. 15, 1938 (R. M. and G. E. Bohart).

Dianthidium platyurum Cockerell

D. platyurum was described from San Francisquito Bay, Lower California, but I find the species well represented in southern California. Here in the cismontane area it is represented by the race *baculifrons*, described by Cockerell as a race of *parvum* and redescribed by Schwarz as *D. ulkei* var. *raparii* (new synonymy). In my opinion *platyurum*, together with its race *baculifrons*, is quite distinct from either *parvum* or *ulkei*, but obviously close to the latter. It differs from *ulkei* in having the

head and thorax shining, with fine, slightly separated punctures. The male genitalia of the two species are nearly the same, but the sagittæ in *ulkei* are more constricted subbasally, and the parameres of the stipites of *platyurum* have a longer, somewhat broader apical expansion, with an incurved or upturned acute point on the inner or dorsal margin at the apex. In Schwarz's figure of the genitalia of *riparii* (JOURNAL OF THE NEW YORK ENTOMOLOGICAL SOCIETY, Vol. XXXVI, plate 13, 1928) the parameres are not quite accurately depicted, as the acute apical angle is represented as being on the outer or inferior margin.

The races of *platyurum* may be distinguished in the female sex as follows:

1. Tergite 6 entirely black; hind tibiæ with a basal spot; basitarsi entirely dark 2.
 Tergite 6 with two oval convergent yellow marks; tergites 1 to 5 each with a broad band interrupted medially on 2 to 5 and emarginate behind on each side on 1 and 2, the emarginations on 3 to 5 being represented by enclosed black spots; yellow marks on sides of clypeus united by a yellow band across the top; hind tibiæ with a small apical spot confluent with the basal mark by extension of the yellow along dorsal margin; hind basitarsi with a yellow spot *mohavense* n. subsp.
2. Yellow band on tergites 1 to 5 rather broad, interrupted medially on 2 to 5; posterior emarginations of bands on each side, deep but rather narrow, sometimes breaking through on 1, and sometimes enlarged on 5 to isolate a small lateral yellow spot; yellow mark on each side of clypeus moderately large, often so shaped as to make the median black area broad above and narrowed below; mark on mesopleura rather small *baculifrons* Ckll.
 Maculations paler yellow; spot on each side of clypeus in the form of a small vertical stripe, or entirely absent; mark on mesopleura very small or absent; yellow band on tergites 1 to 4 narrower, more broadly interrupted medially on 2 to 4, that on 1 divided into three spots, that on 2 into four, and the posterior emarginations on 3 and 4 very deep and almost breaking through; band on 5 represented by two roundish or subtriangular marks *platyurum* Ckll.

***Dianthidium platyurum platyurum* Cockerell.**

I have one of the two original males from San Francisquito Bay, Lower California.

A female from Morongo Valley, San Bernardino Co., California, on *Gutierrezia lucida*, Sept. 12, 1940 (Cockerell), agrees with the original description except in having a short pale-yellow ver-

tical line on each side of clypeus. The yellow dot on the mesopleuron no doubt will be found to disappear when a series is available. There are no spots on the vertex, and the yellow line behind the eye is short.

***Dianthidium platyurum baculifrons* Cockerell.**

Specimens of *riparii* Schwarz, of which I have the type, have been compared with the type of *baculifrons* and found to be identical. *D. baculifrons* is a common species at Riverside. In the Academy collection it is represented by a male from Voltaire, Los Angeles Co., Sept. 5, 1923 (J. D. Gunder), and a female from Bishop, Inyo Co., June 21, 1929 (Van Dyke). I have also seen a female from San Diego Co., Oct. 4, 1913 (Van Duzee).

***Dianthidium platyurum mohavense* new subspecies.**

Similar to typical *platyurum* and *baculifrons* in structure, but with considerably more extensive markings.

FEMALE.—Black, the maculations a little more orange yellow than in *baculifrons*. Yellow marks of clypeus large and united across the summit by a narrow yellow band. A small supraclypeal spot present. Lateral marks of face and frontal spot as in *baculifrons*. Two small spots on vertex behind ocelli. Stripe behind eyes nearly as long as the eye. Marks on notum, including tubercles and tegulae, as in *baculifrons*. Mark on mesopleuron larger, but only moderately large in comparison with some other species. A small yellow spot on metapleuron. Apex of femora broadly and stripe on front and middle femora behind, yellow. Stripe on outer side of front and middle tibiae and spot at base of hind basitarsi, yellow. Hind tibiae with the yellow on basal half confluent with a small apical spot by an extension along dorsal margin. Tergites 1 to 5 each with a broad yellow band, narrowly interrupted medially on 2 to 5. Bands on 1 and 2 narrowly emarginate behind on each side, but the emarginations on following segments represented by small enclosed black spots. Tergite 6 with two large convergent oval marks. Length, 7 mm.; anterior wing, 6 mm.

One female (holotype), Mohave River, near mouth of Deep Creek, San Bernardino Co., California, on *Eriogonum fasciculatum*, Aug. 14, 1936 (Timberlake), in collection of the Citrus Experiment Station.

This may prove to be merely an extreme variation of *baculifrons*.

***Dianthidium concinnum* (Cresson)**

This species, of which I have not seen the male, probably belongs to the *ulkei* group. I have examined 2 females from Boulder, Colorado, one collected on *Psoralea*, Aug. 10, 1906 (W.

P. Cockerell), the other on *Chrysopsis*, June 27, 1939 (Timberlake); 1 female, Prescott, Arizona, on *Lotus wrightii*, July 5, 1932 (Timberlake); and 1 female, Sheridan County, Kansas, Aug. 27, 1941 (Dean).

The specimens examined are all very similar in color and markings, and the Kansas specimen, together with three others of the same data, was compared by Schwarz with the Cresson types and found to be virtually identical. However, in the specimens examined by the writer, the ventral scopa is yellowish white, whereas Cresson described it as fuscous. It is possible that a more northern and western race is indicated by the pale scopa; but, on the other hand, nothing is known of the variation in the type region, Texas, and besides, it is a well-known fact that several North American Anthidiines that have the scopa normally dark, vary greatly in this respect, and that the variation is mostly not of racial significance.

GROUP OF DIANTHIDIUM PARVUM (CRESSON)

The males of the three species of the *parvum* group are separated as follows:

1. Hind coxal spur conical; front coxæ unarmed; sagittæ of genitalia taken together nearly parallel-sided, little depressed at apex, with apical corners less prominent 2.
Hind coxal spur short, bulbous at base and rather blunt at apex; front coxæ with a low rounded longitudinal crest on under surface at apex; sagittæ broader, strongly depressed, and concavely impressed at apex, with apical corners prominent and rounded *subparvum* Swenk.
2. Median lobe of seventh tergite triangular, acute at apex; sagittal lobes with a common large oval foveate impression, invested with a fine appressed pubescence *fraternum* n. sp.
Median lobe of seventh tergite more parallel-sided, blunt at apex, the notch between it and lateral lobes consequently more pronounced and rounded; spurs of hind coxæ larger; sagittal lobes nude on the more depressed disk, with a fringe of very short hair on each side of the apex *parvum* (Cress.).

The recently described *D. heterulkei* Schwarz may also belong to the *parvum* group, but I have not been able to examine it.

Dianthidium subparvum Swenk

The identity of the species described by Swenk has remained a little uncertain. Schwarz, in his account of a small series of the

parvum group from British Columbia (the Canadian Entomologist, Vol. 60, p. 217, 1928), reports that some of the males had a short bulbous spine on the hind coxa, which in other examples was well developed. It is thus evident that both *parvum* and the species with the short bulbous spine exist side by side in that region and that both exhibit considerable undermaculation. It is therefore a question whether *subparvum* is the short-spined species or actually an undermaculated form of *parvum*. Referring to Swenk's description of the type female from Pullman, Washington, we find that he says: "Vertex and mesoscutum very closely punctured, finely so on the vertex." In regard to the male from British Columbia, he says: "Hind coxæ with large stout yellow spines; head and thorax densely but not coarsely punctured." In *parvum* the punctures of the frons and vertex are a little separated, distinctly more so than on the mesoscutum, and also the conical coxal spine of *parvum* would hardly be called "stout." I believe that it is evident, therefore, that the species Swenk described is the one with the short bulbous coxal spine in the male sex, which in its various forms has been described by Schwarz as *semiparvum*, *gallatinæ*, and *swenki*.

Holding to this belief, I present the following table of the races, or nominal forms of *subparvum* (females):

1. Abdominal bands moderately wide, all emarginate behind on each side or with enclosed black spots on posterior segments; tergite 6 entirely black or with two yellow spots; mesopleura immaculate 2.
 Bands on tergites 1 to 6 very broad, not interrupted, except slightly on middle segments, and without posterior emargination, except slight ones on tergites 1 and 6; mesopleura with a large yellow spot; outer side of tibiæ entirely yellow; clypeus yellow, with a narrow median black stripe (southern California) *swenki* Schwarz.
2. Tergite 6 immaculate; band on tergite 1 in form of three spots 3.
 Tergite 6 with two yellow spots; band on tergite 1 entire, or with emarginations partially breaking through; bands on tergites 2 to 5 more or less interrupted medially, with the posterior emarginations on each side rather small and sometimes replaced by enclosed black spots on 3 to 5; axillæ and scutellum usually maculated; median black area of clypeus broad; yellow stripe on tibiæ nearly complete (Utah to northern California) *semiparvum* Schwarz.
3. Posterior emarginations of abdominal bands broad, those on tergite 1 completely breaking through; axillæ and scutellum immaculate, or with traces of yellow spots; yellow marks of mesoscutum often absent;

clypeus with a small yellow spot on each side; yellow stripes on tibiae more or less confined to basal half, at least on front and hind leg (Washington and British Columbia)*subparvum* Swenk.
Similar, but band on tergite 2, and sometimes that on 3, broken into four spots; mesoscutum maculated (Montana)*gallatinae* Schwarz.

***Dianthidium subparvum subparvum* Swenk.**

It is probably that *gallatinae* will prove to fall within the limits of variation of *subparvum*, when large series are available for study from the northwest.

Of *subparvum*, I have examined a male from Summerland, British Columbia, Aug. 9, 1916 (Sladen), and a female from Wenatchee, Washington, June 8, 1919 (Melander), both in the American Museum collection.

***Dianthidium subparvum semiparvum* Schwarz.**

This was described by Schwarz from Utah, but I would include all moderately undermaculated forms from northern California and Oregon.

In the Academy collection I find 1 male, quite typical, from Moscow, Idaho, July 25, 1925 (C. L. Fox); 1 female, Mt. Hood, Oregon, 3,000–6,000 feet, Aug. 6, 1925 (Fox); a male and female from Modoc Co., California, the female from Buck Creek, July 21, 1922, the male from Lake City, July 28 (Fox); 1 female, Mt. Lassen, 6,000–8,000 feet, Aug. 2, 1938 (Van Dyke); 1 female, Lassen National Park, Sept. 9, 1941 (Van Dyke); and 1 female, Gold Lake, Sierra Co., Aug. 4, 1921 (Fox).

In the Cazier collection of the American Museum is a series of eight specimens, mostly collected by the Bohart brothers at Carrville, Trinity Co., California, Hot Creek and Leavitt Landing, Mono Co., and at Donner Lake. These were all collected in May and June.

***Dianthidium subparvum swenki* Schwarz.**

This was described as a variety of *parvum*, but included two species, the majority of the specimens being actually a form of *parvum*, whereas the holotype and three male paratypes are a form of *subparvum*. Schwarz has given a good figure of the genitalia (see JOURNAL NEW YORK ENTOMOLOGICAL SOCIETY, Vol. XXXVI, plate 13, 1928), which will answer just as well for typi-

cal *subparvum*. The southern race differs in the much fuller maculations. As two distinct species were confused in Schwarz's description, it is desirable to redescribe the race as follows:

MALE.—Mandibles, clypeus, suprclypeal and lateral marks and stripe behind eye, pale yellow. Frontal spot sometimes present. Anterior marks on mesoscutum and marks on axillæ and scutellum usually moderately large, although those on axillæ sometimes very small. Apex of femora, stripe on front and middle femora behind, tibiæ except beneath, and basitarsi on outer side, yellow. Broad band on tergites 1 to 6, and tergite 7, except basal margin, yellow. Bands all continuous, but at least those on tergites 3 to 5 more or less deeply notched in front medially, and all with a rather small emargination behind on each side. Punctuation of frons and mesoscutum somewhat coarser than in *parvum*, the scutum less shining. Pubescence yellowish, much more abundant than in *parvum*, the scutum with numerous erect hairs. Spur of hind coxa short and bulbous at base. Median lobe of seventh tergite approximately as in *parvum* and not so broad as in typical *subparvum*. Length, about 7.5–8.5 mm.; anterior wing, about 6.8 mm.

FEMALE.—Mandibles black. Clypeus yellow, with a rather narrow median black stripe. A very small supraclypeal spot and sometimes two yellow dots between antennæ. Frontal spot rather large. Stripe behind eye often extending whole length of eye, but no spots on vertex. Maculations on tegulæ, tubercles, mesoscutum, axillæ, scutellum, and mesopleura very large. Large spot at apex of femora, broad stripe behind on front and middle femora, tibiæ except beneath, large spot on hind basitarsi, and small spot on front and middle pair, yellow. Tergites 1 to 6 each with a broad yellow band. Bands on tergites 2 to 4 narrowly interrupted medially, those on 5 and 6 notched medially in front, and all with a small emargination behind on each side. Mandibles nearly as in *ulkei*. Punctures of clypeus, frons, mesonotum, and mesopleura rather coarse and very close, on a shining surface. Punctures on these parts and on tergites nearly uniform in size. Pubescence ochraceous, moderately dense, with numerous short erect hairs on mesoscutum. Scopa pale fulvous. Length, about 8 mm.; anterior wing, 6.7 mm.

I have the male holotype of *swenki* from Riverside, and 3 male paratypes from Big Pines Camp, San Gabriel Mts. The true female of *swenki* was included under *davidsoni* by Schwarz and is indeed very similar to that species in many ways, but *davidsoni* has the frons dull, with finer, denser punctures.

In the Academy collection is 1 male from Herkey Creek, June 24, 1934 (I. McCracken), and 1 male from Idyllwild, June 25, 1928 (Van Dyke), in the San Jacinto Mts. In the material recorded by Cockerell in 1925, is a pair from Bear Valley, San Bernardino Mts., Aug. 1913 (F. C. Clark), the male determined as *parvum* and the female as *consimile*. This race has been collected also by Linsley at Hemet Reservoir, Idyllwild, and at Vandeventer Flat, in June, 1939. The male has been taken by the writer in the San Jacinto Mts., and the female at Riverside, Big Pines Camp, Idyllwild, and Bear Valley, at flowers of *Gutierrezia*, *Pentachæta*, *Chænactis*, *Erigeron*, *Corethrogyne* and *Aster*.

***Dianthidium fraternum* new species**

This is another segregate of the *parvum* group, which is actually closer to *parvum* than to *subparvum*. The male characters have been given in a preceding table. The female is distinguished from *parvum* by having the mesoscutum dull, with the punctures comparatively dense and becoming very crowded on the anterior middle.

The two known races of *fraternum* may be distinguished by the following table, which may be used for either sex, although the color characters apply especially to the females:

1. Punctures of mesoscutum fine; pubescence short and appressed; usual marks of thorax well formed, except mark on mesopleuron, which is small or absent; tergite 6 with two roundish yellow spots.

fraternum n. subsp.

Punctures of mesoscutum coarser; pubescence comparatively long and erect; yellow markings reduced, the supraclypeal area, frons, vertex, mesopleura, and tergite 6 immaculate *hirtulum* n. subsp.

***Dianthidium fraternum fraternum* new subspecies.**

MALE.—Black, the base of tegulæ ferruginous. Mandibles (except apex), clypeus, lateral face-marks narrowed above, small frontal spot, short stripe behind eyes, usual marks on tubercles, tegulæ and anterior margin of mesoscutum, and continuous or slightly interrupted band on axillæ and scutellum, pale yellow. Spot at apex of femora, stripe behind on front and middle

femora, outer side of tibiae and basitarsi, and markings of abdomen, pale yellow. Hind tibia sometimes with a black mark invading yellow from anterior side just beyond middle. Bands on tergites 1 to 5 moderately wide, with the posterior emargination on each side rather deep and moderately wide, those on 1 often breaking through. Bands on tergites 2 to 5 (sometimes 3 and 4 only) narrowly interrupted medially. Band on tergite 6 narrow, but widened in middle and emarginate behind, or sometimes reduced to small lateral spots. Tergite 7 pale yellow, except basal margin. Punctures of frons close and rather coarse, with shining intervals, those of the vertex becoming more separated in middle and a little finer at sides. Punctures of clypeus and mesopleura close, subequal to those of frons. Mesoscutum dull, rather finely and subrugosely punctate, the sculpture on anterior middle becoming denser and more obscure. Pubescence whitish, that of mesoscutum more ochreous, very short, and mostly appressed. Tergite 7 similar to that of *parvum*, but the median lobe or tooth triangular, acute at apex, with the emargination between its base and lateral lobes small. Genitalia as in *parvum*, but sagittae have a common, large, oval, foveate impression, lined with fine appressed hairs. Length, 7-9 mm.; anterior wing, 6.5-7.8 mm.

FEMALE.—Similar to male. Markings pale lemon yellow, including triangular mark on each side of clypeus, lateral face-marks narrowed above, small frontal spot, stripe behind eyes, usual marks on tegulae, tubercles and anterior margin of mesoscutum, nearly continuous band on apical rim of axillae and scutellum, small spot on mesopleura (sometimes wanting), spot at apex of femora, stripe on front and middle femora behind, incomplete stripe on outer face of tibiae (that on hind pair reaching middle on dorsal margin), a band on tergites 1 to 5, and two roundish spots on tergite 6. Band on tergite 1 interrupted on each side, and those on 2 to 5 well interrupted medially. Posterior emarginations of bands on 2 to 5 moderately large, becoming progressively smaller on apical segments, those on 5 sometimes represented by enclosed black spots. Mandibles with two small apical teeth and concave cutting edge as in *parvum*. Sculpture and pubescence as in male. Ventral scopa pale brownish fulvous. Length, 7-8 mm.; anterior wing, 6.4-7 mm.

Holotype, male, and allotype, taken in copula, on *Gaillardia pinnatifida*, at Prescott, Arizona, July 7, 1932. Paratypes as follows: 6 males, 14 females, at Prescott, on *Gaillardia*, *Cirsium*, *Erigeron*, *Asclepias tuberosa*, *Lotus wrightii* and *Aplopappus gracilis*, June 26 to July 7, and Aug. 30; 1 female, 5 miles northwest of Prescott, on *Senecio*, July 4; and 1 female, near Jerome, Arizona, about 7,000 feet, on *Monarda stricta*, July 3 (Timberlake). Foregoing types in collection of the Citrus Experiment Station. One female (paratype) from Tex Canyon, Chiricahua Mts., Cochise Co., Arizona, 5,000-6,000 feet, Oct. 8, 1927 (J. A.

Kusche), in collection of California Academy of Sciences. One female (paratype), Dripping Springs, New Mexico, Aug. 10 (Townsend), in American Museum collection.

The two female paratypes from Southern Arizona and New Mexico are nearly typical, but a male from Carr Canyon, Huachuca Mts., Arizona, Aug. 10, 1940 (Michener), differs in having the markings creamy white.

***Dianthidium fraternum hirtulum* new subspecies.**

This form looks like a separate species in regard to sculpture and pubescence, but as the other morphological characters, including structure of the male genitalia, are exactly as in *fraternum*, it is evidently only a race of that species.

MALE.—Black, with rather bright yellow markings. Mandibles (except apex), clypeus, lateral marks narrowed above, small spot behind upper part of eyes, smallish spot on tegulae, tubercles and anterior margin of mesoscutum, and broadly interrupted slender line on apex of scutellum, yellow. Small spot at apex of middle and hind femora, stripe on outer side of tibiae, not quite reaching apex, that on hind pair curving forward near apex to set off a large black invasion from anterior side, and incomplete stripe on basitarsi, much longer on hind pair, yellow. Tergites 1 to 5 each with a rather narrow yellow band, that on 1 interrupted on each side, those on other segments slightly interrupted medially and broadly emarginate behind on each side. Tergite 6 with a yellow dot medially near apex. Tergite 7 yellow, with tip of median lobe and basal margin rather broadly black. Spur of hind coxa rather small and conical. Frons and vertex shining, with rather small, nearly contiguous punctures, becoming coarser on middle of frons. Mesoscutum a little shining, with coarse contiguous punctures about equal to those on middle of frons. Mesopleura coarsely and closely punctured. Pubescence unusually long and loose, the hair of mesoscutum entirely erect. Length, about 8 mm.; anterior wing, 7.2 mm.

One paratype (Truckee) has maculations a little fuller, those on thorax larger, with narrow stripe on scutellum continuous and a small spot on each axilla, band on tergite 2 continuous, and tergite 7 yellow except basal margin. Another paratype (Yosemite) has maculations behind eyes and on tegulae, tubercles and mesoscutum very small, axillae and scutellum immaculate, band on tergite 2 divided into four spots, tergite 6 immaculate, and tergite 7 black except on lateral lobes.

FEMALE.—Black, the base of tegulae piceous. Clypeus black, with a small yellow spot on each side. Lateral face-marks reduced to a slender line above antennae. Stripe behind summit of eyes short. No marks on supraclypeal area, frons, and vertex. Marks on tegulae, tubercles, anterior margin of mesoscutum, and scutellum, small. Mark on axillae very small or absent; mesopleura immaculate. Small spot at apex of middle and hind femora, basal stripe on front and middle tibiae reaching middle, and basal spot on

hind tibiae, yellow. Tergites 1 to 5 each with a yellow band, rather strongly interrupted medially on 2 to 5 and divided into three spots on 1. Posterior emargination of the bands on 2 to 5 broad, those on 5 abbreviating the band laterally. Tergite 6 immaculate. Frons less shining than in *fraternum*, the punctures closer, becoming slightly separated in middle; mesoscutum less dull; the punctures coarser. Punctures of mesopleura coarse and close. Face, vertex, and mesonotum unusually hairy, the pubescence long, erect, pale fulvous brown. Ventral scopa nearly of the same color. Wings strongly infuscated. Length, 8 mm.; width of abdomen, 3 mm.; anterior wing 7 mm.

Holotype, male, Mineralking, Tulare Co., California, Aug. 4, 1923 (C. L. Fox), and two male paratypes, from Truckee, Nevada Co., June 21, 1927 (Van Duzee), and Yosemite Valley, July 12, 1921, (Van Dyke), in collection of California Academy of Sciences. Two male paratypes from Mineralking, Aug. 5, 1935 (Bohart), and Carson Pass, 8,000 feet, Sept. 1, 1934 (Bohart), in Cazier collection, American Museum. Two females (allotype and paratype) from Convict Lake, Mono Co., Aug. 6, 1938 (Bohart), in the Bohart collection.

Dianthidium parvum (Cresson)

The following table will distinguish the known forms of *parvum*. The variety *heteropoda* Schwarz is not included, but I believe it would run with typical *parvum*, from which it differs by the ferruginous legs.

- | | |
|---|---------------------------|
| 1. Females | 2. |
| Males | 3. |
| 2. Markings pale yellow, or nearly creamy white; mesopleura and sixth tergite immaculate; stripes on front and middle femora little developed; hind tibiae yellow on basal half; bands on tergites 1 to 5 with rather large posterior emargination on each side | <i>parvum</i> (Cress.). |
| Markings bright yellow; mesopleuron with a large spot; sixth tergite with two yellow marks; stripes on femora well developed and outer surface of tibiae nearly all yellow; posterior emarginations of abdominal bands small and sometimes absent except on basal segments. | |
| | <i>schwarzi</i> n. subsp. |
| 3. Maculations full; femoral stripes well developed; tibiae almost entirely pale on outer surface; anterior marks of mesoscutum large | 4. |
| Femoral stripes less developed, often absent on middle femora; stripes on tibiae not covering full width of outer surface, the hind tibiae often with a black area beyond the middle on anterior side; anterior marks of mesoscutum small; abdominal bands with large posterior emarginations, those on tergite 1 dividing band into three spots. | |
| | <i>parvum</i> (Cress.). |

4. Maculations creamy white, paler than in typical *parvum*; posterior emarginations of abdominal bands rather large, the band on tergite 1 sometimes divided into three spots; fourth antennal joint, dark part of legs and venter sometimes ferruginous red *basingeri* n. subsp.
 Maculations bright yellow; posterior emarginations of abdominal bands small, sometimes almost absent on middle segments or replaced by small enclosed black spots; band on tergite 1 entire *schwarzi* n. subsp.

***Dianthidium parvum parvum* (Cresson).**

I have typical or nearly typical *parvum* from 6 miles north of Embudo, New Mexico, Aug. 15, 1931, on *Cleome*; and from Prescott, Arizona, on *Asclepias*, *Lotus*, *Cirsium*, *Aplopappus*, and *Gaillardia*, June 27 to Sept. 1 (Timberlake). In the Academy collection is one female from Logan, Utah, July 18, 1922 (Van Duzee). In the Bohart collection is another female from Convict Lake, Mono Co., California, Aug. 6, 1938. The type locality is Colorado.

***Dianthidium parvum schwarzi* new subspecies.**

D. parvum var. *swenki* Schwarz, Jour. New York Ent. Soc., XXXVI, 402, 407, 1928, in part.

FEMALE.—Black; the base of tegulae ferruginous, and dark parts of abdomen often a little stained with this color. Small marks on each side of clypeus, lateral face-marks attenuate above, large frontal spot and stripe behind eyes, usual marks on tegulae and tubercles, large mark on each side of anterior margin of mesoscutum, continuous band on apical rim of axillae and scutellum, and rather large mark on mesopleura, bright yellow. Apex of femora, broad band on front and middle pair behind, tibiae except beneath, and mark on basitarsi, large on hind pair, yellow. Tergites 1 to 6 each with a broad yellow band, those on 3 and 4 interrupted, those on 5 and 6 deeply notched in front medially, or all except that on tergite 1 slightly interrupted medially. Posterior emarginations of bands on each side small, generally limited to tergites 1 and 2, but sometimes present on 3, with small enclosed black spots on 4 and 5. Mark on tergite 6 generally bandlike, although abbreviated laterally and sometimes reduced to two well-separated roundish spots. Mandibles with distinct preapical notch and tooth, the cutting edge within concave. Frons shining, with slightly separated punctures. Mesoscutum less shining, with smaller and closer punctures than the frons. Pubescence of mesoscutum short and mostly appressed. Length, 6.5–8 mm.; anterior wing, 5.2–6.8 mm.

MALE.—Like female, but clypeus and mandibles, except apex, yellow. A small supraclypeal mark present. Maculations of thorax often a little smaller, the mark on mesopleura small or absent. Legs as in female, but basitarsi entirely yellow on outer side, and the small joints of tarsi ferruginous.

Sometimes the hind tibiae have a small invasion of black from the anterior side beyond the middle. Bands on tergites 1 to 6 broad and continuous, although more or less narrowed or notched medially in front on middle segments. Posterior emargination on each side small, sometimes in form of enclosed spots on posterior segments. Tergite 7 entirely yellow, except extreme basal margin. Venter usually dark ferruginous, and the dark parts of tergites, especially apically, often stained with this color. Puncturation and pubescence as in female. Length, 6.5–8.5 mm.; anterior wing, 5.9–6.9 mm.

Type series in collection of the Citrus Experiment Station includes 88 specimens of both sexes from Riverside, California, May 29 to Oct. 26, taken mostly on *Gutierrezia californica*, but also on *Stephanomeria*, *Heterotheca*, *Corethrogyne*, and *Lotus scoparius*. The holotype is a female marked as the allotype of *swenki*, and the allotype is a paratype male of *swenki*, both taken May 29, 1925. (The type series also includes 13 other paratypes of *swenki*.) In addition, there is 1 female (paratype), Mohave River, near mouth of Deep Creek, taken on *Eriogonum gracile*, Aug. 14 (Timberlake); and 1 male (paratype), Jacumba, San Diego Co., on *Eriogonum*, Aug. 12, 1917, the latter specimen in collection of Dr. Bequaert.

Dianthidium parvum basingeri new subspecies.

A race of *parvum* from southern Arizona and the Colorado desert, similar to *schwarzi*, but with cream-colored maculations. (Specimens from northern Arizona are almost typical *parvum*, with the markings nearly as pale as in *basingeri* but considerably more reduced.) Sometimes the dark parts of the legs in this race are ferruginous; in this respect they are similar to *heteropoda* Schwarz, which apparently is no more than an individual variant of *D. parvum parvum* (Cresson). I suspect that the ferruginous color is much more frequent in *basingeri* than in *heteropoda*, however, as it is present in one of two specimens examined from the type locality.

MALE.—Black; the central boss of tegulae ferruginous. Maculations creamy white and nearly as full as in *D. parvum schwarzi*. Mandibles except apical margin, clypeus, lateral face-marks narrowed above, supraclypeal and frontal spots, broad stripe behind upper end of eyes, large marks on tegulae, tubercles and anterior margin of mesoscutum, and broad band at apex of scutellum and axillae, white. Apex of femora broadly, stripe on front

and middle femora behind, tibiae except beneath, and outer side of basitarsi, white. Tergites 1 to 6 each with a rather broad white band, narrowed medially in front on 2 and 3 and notched medially on 4 and 5. Posterior emarginations on each side in the form of transverse oval black marks, becoming enclosed on tergites 5 and 6. Tergite 7, white. Punctuation and white pubescence normal for *parvum*. Length, 8.5 mm.; anterior wing, 7 mm.

A paratype has band on tergite 1 interrupted on each side and posterior emarginations of bands on apical segments not becoming enclosed. Dark part of legs and venter ferruginous, this color much apparent on the basal concavity of the first tergite and on the interruptions and emarginations of bands of first two segments. Joint 2 of flagellum also strongly reddened.

Two males (holotype and paratype) collected on the Silverbell road, 12 miles west of Rillito, Arizona, May 2-5, 1935 (A. J. Basinger), in collection of the Citrus Experiment Station. One male (paratype), Shaver's Well, Riverside Co., California, Apr. 8, 1934 (Bohart), in the Cazier collection, American Museum.

GROUP OF DIANTHIDIUM PUDICUM (CRESSON)

The males of this group have the median lobe of the last tergite comparatively long and curved downward, so that the apex lies a little below the level of the lateral lobes. Between the median lobe and the broad lateral lobes is a distinct rounded emargination on each side. This tergite seems to be practically identical in the three known species, but the genitalia show small but constant differences. The three species may be separated as follows:

1. Frons more or less dull, the punctures dense; punctures on anterior middle of mesoscutum becoming appreciably finer and denser; in female the cutting edge of mandible with a distinct notch preapically; sixth ventrite of male not notched at apex 2
 Frons shining between the slightly separated punctures; punctures of mesoscutum hardly finer and denser on anterior middle; mandible of female with only a slight preapical notch, the cutting edge otherwise nearly straight; sixth ventrite of male with a slight notch at apex.
pudicum (Cress.)
2. Cutting edge of mandible (female) distinctly concave between preapical notch and inner angle and fortified by a reciprocally curved carina on inner surface; sagittal lobes of male genitalia tapering gradually on outer margin to the sharp apex *consimile* (Ashm.)
 Cutting edge of mandible straight between preapical notch and inner angle, without a supporting carina on inner surface; sagittal lobes broader and bluntly rounded at apex *plenum* n. sp.

Dianthidium pudicum (Cresson)

The four races of *pudicum* may be distinguished as follows:

1. Clypeus with at least a small yellowish or whitish spot on each side; lateral face-marks not evanescent above antennae; pubescence of both sexes short and more or less appressed 2
 Clypeus entirely black; extension of lateral face-marks above antennae very thin or lacking; abdominal bands divided into three spots on tergite 1 and more or less completely divided into four spots on tergites 2 to 4; head and mesoscutum unusually hairy, especially in male, the hair of mesoscutum being comparatively long and erect.
pudicum (Cress.)
2. Frons and mesopleura maculated; bands on tergites 1 to 4 showing little tendency to become interrupted on each side; markings on legs less restricted 3
 Frons and mesopleura immaculate; bands on tergites 1 to 4 more or less interrupted on each side, especially on 1 and 2; markings on legs restricted to a small spot at apex of femora and a spot at base of tibiæ (more extensive in male); marks on mesoscutum, axillæ, and scutellum small, the axillæ frequently immaculate *decorum* n. subsp.
3. Maculations creamy white; stripe on front and middle tibiæ reaching beyond middle, that on hind pair confined to basal third ... *inyoense* n. subsp.
 Maculations bright yellow; stripes on tibiæ sometimes complete, at least on middle pair *provancheri* Titus

Dianthidium pudicum pudicum (Cresson).

It is my conclusion that the female described by Cresson as *pudens* belongs with typical *pudicum* which was described from the male. Both were collected by Morrison in Nevada and were probably taken at one and the same place. The female is notable for its depleted maculations, and the male for its unusually hairy condition. A male from Onion Valley, Mono Co., California, and another from Giant Forest, Tulare Co., have the markings yellower than usual and in this respect verge toward the race *provancheri*.

In the Academy collection I have examined 3 males from Yosemite Valley, July 7, 1921 (Van Dyke); Giant Forest, July 14, 1923 (C. L. Fox); and Fallen Leaf Lake, California, July 17, 1917 (Van Duzee). I have also examined 3 females from Strawberry Valley, Eldorado Co., Aug. 14, 1912 (Van Dyke); Huntington Lake, 7,000 feet, Fresno Co., California, July 4, 1919 (Van Duzee); and from Longmire, Ranier National Park, Washington,

July 27, 1920 (Van Dyke). In the American Museum collection is one pair from Mammoth Lake, Mono Co., California, the female taken July 14, 1933, and the male, Aug. 6, 1936 (R. M. and G. E. Bohart). The Onion Valley specimen mentioned above was taken June 17, 1937, and was submitted to me by Linsley and Michener. In my own collection is a female from Lake Tahoe, California, July, 1925 (F. X. Williams).

***Dianthidium pudicum decorum* new subspecies.**

This apparently is the form of *pudicum* recorded by Cockerell, Swenk, and Schwarz from Colorado, Montana, Wyoming, Utah, and the Northwest, and from the province of Alberta. It differs from typical *pudicum* in being considerably less hairy and in having somewhat fuller maculations.

FEMALE.—Black, with creamy-white markings. Clypeus black, with a small white spot on each side, more or less separated from lateral face-marks by a black line. Lateral face-marks slender above level of antennæ. A short white line behind summit of eyes. Marks on anterior margin of mesoscutum and on axillæ and scutellum small, the axillæ frequently immaculate. No marks on middle of frons or mesopleura, but tubercles and tegulæ well maculated. Small spot at apex of middle and hind femora, and basal spot on tibiæ, white. Tergites 1 to 5 banded, the bands on 2 to 5 strongly interrupted medially and deeply emarginate (or sometimes interrupted) on each side behind. Band on tergite 1 divided into three spots. Tergite 6 immaculate. Head and mesonotum less hairy than in *pudicum*, the hair of mesoscutum mostly very short and subappressed. Ventral scopa yellowish white. Length, 6.75–8 mm.; anterior wing, 6–6.5 mm.

MALE.—Mandibles, clypeus, lateral face-marks narrowed to a line above antennæ, and small supraclypeal mark, creamy white. Mark behind summit of eyes and maculations of thorax as in female. Small spot at apex of femora, short narrow line on lower posterior margin of front femora (often feeble or absent), stripe on outer side of four anterior tibiæ, basal and apical spot on hind tibiæ, and outer side of basitarsi, white. Bands on tergites 1 to 5, and tergite 7 except basal margin, white. Band on tergite 1 interrupted on each side; bands on 2 to 5 usually interrupted medially and deeply and more or less broadly emarginate behind on each side, emarginations sometimes breaking through on 2 and more rarely on 3. Tergite 6 usually immaculate (in one specimen with four spots in a transverse row). Hair of mesoscutum mainly appressed, with a few short erect hairs interspersed. Length, 7–8 mm.; anterior wing, 6.1–7 mm.

Six females, 7 males (holotype, female, allotype, and paratypes), Lewiston, Idaho, July 14–21, 1925 (C. L. Fox); 2 males, 1 female (paratypes), Madras, Oregon, July 29, 1937 (Van

Dyke); and 1 male (paratype), Salt Lake City, Utah, June 27, 1922 (Van Duzee), in collection of California Academy of Sciences; 1 male (paratype), Boulder, Colorado, on *Chrysopsis*, June 26, 1939 (Timberlake).

Dianthidium pudicum inyoense new subspecies.

Much like *provancheri*, but the maculations creamy white as in typical *pudicum*.

FEMALE.—Black, with creamy-white markings. Face-marks include usual lateral marks, a rather large spot on each side of clypeus, and a minute linear frontal spot, besides usual line behind each eye. Maculations of mesoscutum, axillæ, and scutellum, large, but spot on mesopleura small. Apex of all femora, short stripe behind on front and middle femora, stripe on front and middle tibiæ, reaching a little beyond middle, and basal third of hind tibiæ, creamy white. Tergites 1 to 5 each with a rather broad band, continuous on 1, well interrupted medially on 2 to 5, and all with a rather small oval emargination behind on each side, but emarginations on 4 and 5 almost enclosed. Tergite 6 entirely black. Sculpture and pubescence as in *provancheri*. Length, 7.5 mm.; anterior wing, 6 mm.

MALE.—Usual face-marks present, including a rather large supraclypeal spot and a well-developed stripe behind summit of eyes. Markings of thorax as in female, except that spot on mesopleura is rather large. Apex of femora, short stripe on middle femora behind, stripe on front femora behind, nearly reaching base, tibiæ on outer side, and basitarsi, yellowish white. Hind tibiæ with a small enclosed brownish spot beyond the middle. Tergites 1 to 5 each with a broad creamy-white band, with posterior emarginations on each side rather small. Band on tergite 1 continuous, those on 2 to 4 narrowly interrupted medially, and that on 5 deeply notched in front. Tergite 6 with a narrow curved white band on each side and a dot subapically in middle. Tergite 7 pale as usual, except basal margin. Pubescence white, the hair of mesoscutum short and appressed, but with rather numerous short erect hairs interspersed. Length, about 7 mm.; anterior wing 6 mm.

Holotype, female, Independence, Inyo Co., California, June 14, 1937 (Van Dyke); and allotype, Lone Pine, Inyo Co., June 6, 1937 (Van Dyke), in collection of California Academy of Sciences.

One male (paratype), Owens Valley, Inyo Co., Aug. 2, 1936 (R. M. and G. E. Bohart), verges more toward *decorum*. It has the band on first tergite divided into three spots, the spot on mesopleura lacking, and dark spot on hind tibiæ larger and placed near the middle, where it is confluent with dark area on inner surface.

***Dianthidium pudicum provancheri* Titus.**

This is the common form of *pudicum* in southern California, with its range extending northward at least as far as Antioch. It differs from the other forms of *pudicum* in having the maculations bright yellow.

In the female the clypeus is broadly black in the middle. A small frontal spot and another on mesopleuron are usually present, and the markings on mesoscutum, axillæ, and scutellum are large. The band on the first tergite is merely emarginate behind on each side, like those on following segments, and the yellow stripes on front and middle tibiæ usually reach the apex. Sometimes the clypeus is almost all yellow, and the tibiæ on outer side, even including the posterior pair, are occasionally almost entirely yellow.

In my collection, *provancheri* is represented from Riverside; from Mill Creek, 4,500 feet, San Bernardino Mts.; ridge north of Pleasant Valley, Mohave Desert, reared from nest (H. S. Fawcett); Camp Baldy, San Gabriel Mts.; from 1½ miles west of Perris, reared from nest; and from 12 miles north of Ensenada, Lower California. The collection includes both sexes reared from a nest and also a pair taken in copula. In the Academy collection is 1 male from Alpine, San Diego Co., Apr. 10, 1915 (M. C. Van Duzee). In the Cazier collection of the American Museum is a small series from Antioch, taken May 18 to Sept. 15. Linsley and Michener have submitted a set of both sexes from Antioch, reared from a nest (H. Lange); and in the Bohart collection are 2 males from Indian Flat and Briceburg, Mariposa Co., and 1 female from El Portal.

Specimens of *pudicum* taken at or near Prescott, Arizona, possibly should be referred to *provancheri*, although they have the maculations a little less full and considerably paler yellow.

***Dianthidium consimile* (Ashmead)**

This species is distinguished from *pudicum* by the denser puncturation of frons and mesonotum, by the sparser puncturation of mesopleura, and also by the more notched cutting edge of mandible of female and by the genitalia of the male. From *plenum* it is distinguished mainly by the concave cutting edge of mandible

in female and by the genitalia in the male, as the maculations in one form or another of the two species may be almost identical. In both, the sixth tergite of the female is normally more or less maculated, whereas it is entirely black in *pudicum*. *D. consimile*, as far as present records go, is confined to the states of California and Oregon. The three races of *consimile* are so easily distinguished by the characters given in the brief diagnosis under each, that a table to separate them is omitted.

***Dianthidium consimile consimile* (Ashmead).**

The female of typical *consimile* has the clypeus entirely yellow, a long stripe behind eyes, the frontal spot and marks on mesoscutum, axillæ, scutellum, and mesopleura large, and the abdominal bands broad, although moderately emarginate behind on each side, or with enclosed black spots.

In the Academy collection this race is represented from Idyllwild, San Jacinto Mts.; Mill Creek, San Bernardino Mts.; and from Soboba Hot Springs, Riverside Co., California. The localities represented in my collection are Mt. Lowe; Camp Baldy and Lone Pine Canyon, San Gabriel Mts.; Snow Creek, 5,000 feet, Mountain Home Creek, and Mill Creek, San Bernardino Mts.; and San Felipe Creek, San Diego Co. In the Cazier collection of the American Museum are specimens from Keen Camp, San Jacinto Mts.; Sunset Valley, Santa Barbara Co.; Palmdale, Mohave Desert; and Leavitt Meadows, Mono Co. In the Linsley-Michener collection I found specimens from Palmdale; from Westwood Hills, Los Angeles County; and from Vandeventer Flat and San Jacinto River, 2,500 feet, San Jacinto Mts.

Two females of *consimile* from Mt. Diablo, collected probably by E. Brannigan, are nearly like the typical subspecies, but the clypeus has a broad median black stripe, the pubescence is a little denser, with numerous short erect hairs on the mesoscutum, and the punctures of mesopleura are closer, quite equalling the condition in some forms of *pudicum*. Possibly these specimens represent another race, but more material is desirable.

***Dianthidium consimile dubium* Schwarz.**

This race is easily distinguished from the preceding by the ferruginous boss of the tegulæ and the brownish to testaceous

color of the apex of the tergites. The maculations are paler yellow than in typical *consimile* but are otherwise similar, except that the clypeus has a median black stripe and the posterior emarginations of the abdominal bands are larger and deeper, yet often enclosed by the yellow on fourth and fifth tergites. The band on first tergite is often broken into three spots; that on the second, into four.

In the Academy collection there is a large series from Twain Harte, 4,000 feet, Tuolumne Co., on *Grindelia*, July (Blaisdell); Murphy, 2,500 feet, Calaveras Co., on composite, Sept. 8-19 (Blaisdell); Potwisha, Sequoia National Park, June 20 (Van Dyke); and Three Rivers, Tulare Co., July 29 (C. L. Fox). Specimens from Cascada, Fresno Co., from Mokelumne Hill, Calaveras Co., California, and from Ashland, Oregon, that were recorded by Cockerell as *consimile*, also belong here, although a female from Cascada was determined by him as *provancheri*. At the Citrus Experiment Station are specimens from Hospital Rock, Sequoia National Park, Sept. 4 (Michener), and from Camp Nelson, Tulare Co., on *Lotus americanus*, June 25 (Timberlake), besides type material previously recorded by Schwarz. In the Bohart collection are specimens from Briceburg, El Portal, Yosemite Valley, and Mariposa, California. In the Cazier collection of the American Museum are specimens from Sequoia National Park, 3,500 feet, and Yosemite Valley, 4,000 feet.

Dianthidium consimile mccrackenæ new subspecies.

The female of this race differs from other forms of *consimile* in having the sixth tergite immaculate. It looks much like *pudicum*, but the dense punctures of the frons and mesoscutum, sparse punctures of the mesopleura, and the structure of the mandibles indicate its place as a form of *consimile*.

FEMALE.—Black, with pale-yellow maculations as follows: small spot on each side of clypeus, lateral marks expanded below antennæ and slender above, short line on middle of frons, stripe behind upper part of eyes, usual mark on tubercles and tegulæ, smallish mark each side on anterior margin of mesoscutum, mark on axillæ and interrupted apical band on scutellum, small mark on mesopleuron, small spot at apex of middle and hind femora, long stripe on posterior side of front femora below, narrow stripe on front and middle tibiæ expanded apically on middle pair, small spot at base of hind

tibiæ, and band of medium width on tergites 1 to 5. Abdominal bands with deep, rather broad emargination on each side behind, those on tergites 1 and 2 more or less completely breaking through. Bands on 2 to 5 rather broadly interrupted medially; hence tergite 1 with three spots, and tergite 2 with four. Tergite 6 entirely black. Punctures of mesopleura unusually well separated. Pubescence white, very short, and appressed on mesonotum. Ventral scopa yellowish white. Length, 8 mm.; anterior wing, 6 mm.

MALE.—Maculations of head and thorax similar to female, excepting the usual sexual difference. Mandibles, except apex and clypeus, entirely white. A minute supraclpeal spot present and a trace of a frontal spot. Marks on anterior margin of mesoscutum and on mesopleura smaller than in female. Mark at apex of femora larger and a short stripe present on under side of middle femora. Outer side of the tibiæ almost entirely yellowish white but enclosing oval dark spot near middle of hind pair. Outer side of basitarsi also yellowish white. Bands on tergites 2 to 5 pale yellow, with a deep, broadish posterior emargination on each side, completely breaking through on tergites 1 and 2; hence, tergites 1 and 2, each with three spots, the median one on 2 almost twice as broad as that on 1. Bands on tergites 3 to 5 narrowly interrupted medially. Tergite 6 with a slender transverse mark far to each side. Tergite 7 yellowish white, except basal margin and extreme apex of median lobe. Pubescence white, rather long and dense, with numerous erect hairs on mesoscutum.

Holotype, female, and allotype, Glacier Lodge, Big Pine Creek, 800–1,100 feet, Inyo Co., California, Aug., 1929 (Isabel McCracken), in collection of California Academy of Sciences. There are also 2 male paratypes, one from Convict Lake, Mono Co., Aug. 6, 1938 (R. M. Bohart), and one from type locality, June 20, 1937 (W. C. Reeves), in Linsley and Michener collection.

Dianthidium plenum new species

This species is closely allied to *consimile* and is distinguished in the female by the straight cutting edge of the mandible, and in the male by the rounded contour at apex of sagittal lobes of genitalia.

In the following table of the races of *plenum* (females), the characters assigned to *williamsi* apparently are not typical. Probably the true *williamsi* female, when discovered, will have the markings nearly as in *convictorum*, but yellow instead of yellowish white.

1. Tergites 1 to 6 each with a broad yellow band, those on 3 to 5 or 6 narrowly interrupted medially; sides of propodeum and metapleura with a small yellow mark 2

- Tergites 1 to 5 each with a yellow or whitish band, more strongly interrupted medially; tergite 6 with two dots or small roundish spots; propodeum and metapleura often immaculate 3
2. Abdominal bands very broad, with a shallow emargination behind on each side on tergites 1 and 2; small supraclypeal mark and outer side of tibiae and basitarsi yellow *plenum* n. subsp.
Bands on tergites 1 to 6 with an emargination behind on each side, or with enclosed black spot on 4 and 5; no supraclypeal spot; markings on metapleura and propodeum evanescent *williamsi* n. subsp.
3. Markings yellowish white; posterior emarginations of abdominal bands deep, the band on tergite 1 broken into three spots and that on 2 into four spots; tergite 6 with two dots; median black area of clypeus very broad; punctures of mesopleura rather sparse *convictorum* n. subsp.
Markings bright yellow; abdominal bands emarginate behind or with enclosed black spots on tergites 4 and 5; median black area of clypeus varying from absent to more or less broad; mesopleura with coarse close punctures *australe* n. subsp.

***Dianthidium plenum plenum* new subspecies.**

MALE.—Color and markings much as in *consimile*. Maculations yellow except that the face-marks are more or less creamy white. Supraclypeal and frontal spots generally small and sometimes absent. Axillae and scutellum maculated. Spots on anterior margin of mesoscutum and mark on mesopleura generally large. Apex of hind coxae and spurs, apex of femora and broad stripe beneath on front and middle pair, all tibiae except dark stripe beneath not reaching apex, and basitarsi, yellow. Small joints of tarsi mainly ferruginous. Tergites 1 to 6 each with broad yellow band, broadly emarginate behind on each side, the emarginations tending to become gradually smaller on the apical segments. Band on tergite 1 often divided into three spots; bands on 3 to 6 more or less deeply notched in front medially, or even narrowly interrupted. Tergite 6 sometimes almost all yellow except basal margin and median notch, but the posterior emarginations generally more or less developed. Tergite 7 yellow, except basal margin. Ventral fringes on segments 4 and 5 less elongate than in *puaicum*; ventrite 6 also less hairy and not notched at apex. Sagittal lobes of genitalia each rounded at apex. Length, 7.5–9 mm.; anterior wing, 6.8–7.8 mm.

FEMALE.—Maculations nearly as in *consimile*. Clypeus yellow with a median black stripe, sometimes rather narrow and continuous, or widened above and abbreviated anteriorly, or reduced to a narrow line on dorsal half (in *consimile*, clypeus generally all yellow). Postorbital stripe shorter than in *consimile*, and the two transverse marks on vertex small or absent. Supraclypeal spot small or absent, but frontal spot generally well developed. Marks on mesopleura and mesoscutum averaging a little smaller than in *consimile*. Maculations of legs and abdomen as in *consimile*, except that the posterior emarginations or enclosed dark spots of abdominal bands are sometimes

very small or even absent on tergites 4 to 6. Structure, sculpture, and pubescence similar to *consimile*, except cutting edge of mandible, which is straight instead of concave between preapical notch and inner angle. Length, 8-9 mm.; anterior wing, 6.6-7 mm.

Holotype, male, and allotype, Yosemite Valley, above Vernal Falls, on *Monardella lanceolata*, June 27, 1926 (Timberlake), in collection of the Citrus Experiment Station. The following paratypes are in the collection of the California Academy of Sciences; 3 males, 1 female, Twin Rocks, Mendocino Co., July 10 (Van Dyke); 1 male, Giant Forest, Tulare Co., July 22 (C. L. Fox); 1 female, Mt. St. Helena, May 12 (M. C. Van Duzee); and 1 male, Middletown, Lake Co., California, July 22 (Van Duzee).

***Dianthidium plenum williamsi* new subspecies.**

MALE.—Like typical *plenum*, but supraclypeal and frontal spots lacking. Anterior spots of mesoscutum very small, and mark on mesopleura small or lacking. Maculations of axillæ and scutellum reduced to an interrupted thin line, sometimes absent on scutellum. Abdominal bands narrower, with much broader posterior emarginations. Band on tergite 1 divided into three spots; bands on 3 to 5 (or even 2 to 6) interrupted medially. In one paratype (Buck Creek, Modoc Co.), band on tergite 2 in broadly interrupted on each side, and the slender median mark is also narrowly interrupted medially. Tergite 7 yellow, except basal margin. Length, 7.5-9.5 mm.; anterior wing, 7-7.9 mm.

Holotype, male, Truckee, California, July, 1925 (F. X. Williams), in collection of the Citrus Experiment Station. The following paratypes are in the collection of the California Academy of Sciences: 2 males, type locality, July 5 (Mr. and Mrs. E. P. Van Duzee); 1 male, Buck Creek, Modoc Co., July 25 (C. L. Fox); 1 male, South Fork, Kings River, California, July 8 (Van Dyke); and 1 male, Eagle Ridge, Klamath Lake, Oregon, June 24 (C. L. Fox).

The Kings River male has the maculations paler yellow than in the type, and it thus verges toward the race *convictorum*.

One female from Buck Creek, taken with male recorded above, and another from Meadow Valley, Plumas Co., California, 4,000-5,000 feet, June 30 (Van Dyke), are placed with *williamsi* but are not made types, as they seem to be too transitional toward typical *plenum*, differing only in somewhat smaller markings, as recorded in the preceding table.

***Dianthidium plenum convictorum* new subspecies.**

This is a desert race with unusually pale markings.

FEMALE.—Black, with yellowish-white markings. A rounded mark on each side of clypeus, lateral marks, small frontal spot, and short line behind eyes, white. Usual marks on mesoscutum, axillæ, scutellum, tegulæ, tubercles, and mesopleura, well developed. Apex of femora broadly and broad stripe behind on front and middle pair, stripe reaching apex on front and middle tibiæ, outer surface of hind tibiæ with enclosed black mark at middle, and spot on basitarsi, yellowish white. Tergites 1 to 5 each with a yellowish-white band, well interrupted medially except on 1. Posterior emarginations of bands rounded, moderately large, but breaking through on tergites 1 and 2 to form three and four spots, respectively. Tergite 6 black, with two whitish dots. Length, about 7.5 mm.; anterior wing, 6.3 mm.

One female (holotype), Convict Lake, Mono Co., California, July 17, 1933 (G. E. and R. M. Bohart), in collection of American Museum of Natural History.

***Dianthidium plenum australe* new subspecies.**

This race is referred to *plenum* with a little doubt, as the male has not been seen. The female is considerably smaller than in other forms of *plenum*, and the frons and mesoscutum are less dull, although densely punctured.

FEMALE.—Black, with bright-yellow markings. Clypeus entirely yellow except anterior margin, or with a median black stripe, usually narrowed below. Supraclypeal area black, or rarely with a small spot. Lateral face-marks gradually narrowed above antennæ. Frontal spot linear to oval. Stripe behind eyes about one-half to three fourths as long as the eye. Vertex immaculate, or with two transverse spots. Maculations of mesoscutum, axillæ, scutellum, tegulæ, tubercles, and mesopleura, large. A small yellow spot sometimes present on upper end of metapleuron and a smaller one on basal corner of propodeum behind base of wings. Apex of femora rather broadly, broad stripe on front and middle femora behind, outer side of tibiæ, and basitarsi, yellow. Tergites 1 to 5 each with moderately wide yellow band, more or less strongly interrupted medially on 2 to 5 and with small but distinct emarginations behind on each side. Posterior emarginations on tergites 4 and 5 sometimes replaced by enclosed black spots. Tergite 6 with two roundish yellow marks varying from medium-sized to rather large. Frons and mesoscutum with rather dense, moderately fine punctures, the surface less dull than in typical *plenum*. Punctures of mesopleura coarse and close. Pubescence of mesoscutum very short and subappressed. Ventral scopa yellowish white. Length, 6.5–7 mm.; anterior wing, 5.6–5.9 mm.

Holotype, female, Andreas Canyon, near Palm Springs, California, on *Eriodictyon crassifolium*, May 15, 1932 (Timberlake). Paratypes as follows: 1 female, type locality, on *Krameria canes-*

cens, Apr. 24; 1 female, Riverdale, on *Trichostema lanceolatum*, Aug. 11; 1 female, Puente Hills, near Whittier, on *Phacelia distans*, May 11; and 2 females, Camp Baldy, San Gabriel Mts., on *Stephanomeria cichoriacea*, Aug. 21 (all Timberlake), in collection of the Citrus Experiment Station. One female, Palm Springs, Apr. 16 (R. M. Bohart); 1 female, Palm Canyon, Riverside Co., on *Lotus*, Apr. 15 (Bohart); and 1 female, Mt. Diablo, in collections of Messrs. Bohart, Linsley and Michener. One female, Mt. Diablo, June 14, and another, Antioch, Sept. 15 (G. E. and R. M. Bohart), in collection of American Museum of Natural History.

***Dianthidium macswaini* new species**

As far as can be determined in absence of the male, this species is a member of the *pudicum* group, nearest *plenum*. It is distinguished by having the cutting edge of mandible perfectly straight except for the projecting apical tooth. The mandible lacks the preapical notch seen in *consimile* and *plenum* and to a lesser degree in *pudicum*.

FEMALE.—Black, with bright-yellow markings. Clypeus with a large yellow mark on each side, leaving anterior margin and rather broad median stripe somewhat widened above, black. Lateral face-marks almost reaching summit of eyes and acute above. Postorbital stripe reaching middle of eyes. Two transverse spots on vertex sometimes present but absent in holotype. Frontal spot narrow. No yellow on supraclypeal area or on mandibles. Markings on mesoscutum, axillæ, scutellum, tegulæ, tubercles, and mesopleura, large. Apex of femora rather broadly, stripe on front and middle femora, on lower posterior margin, broad stripe on tibiæ, and spot on base of basitarsi, yellow. Stripe on hind tibiæ sometimes narrowed at the middle. Tergites 1 to 5 each with a broad yellow band, narrowly interrupted medially on 3 to 5 and emarginate behind on each side on 1 to 3. Posterior emarginations on 4 and 5 represented by more or less enclosed black spots. Tergite 6 black, with two large yellow marks. Frons moderately dull, densely punctured, the punctures finer than those of clypeus. Punctures of vertex somewhat sparser and fading out toward posterior rim. Mesoscutum dull, finely and very densely punctured, with the punctures finer than those of frons and not becoming finer and denser on anterior middle. Punctures of mesopleura coarse and rather close. Pubescence of head and thorax pale fulvous, rather long and erect on frons and vertex, but mostly short and subappressed on mesoscutum. Ventral scopa pale fulvous. Wings strongly infuscated. Length, about 7 mm.; anterior wing, 6.2 mm.

Two females (holotype and paratype) reared from a nest, Mt. Diablo, Contra Costa Co., California, May 9, 1939 (J. W. MacSwain), in collection of E. Gorton Linsley.